Amniotic membrane in ocular surface disease

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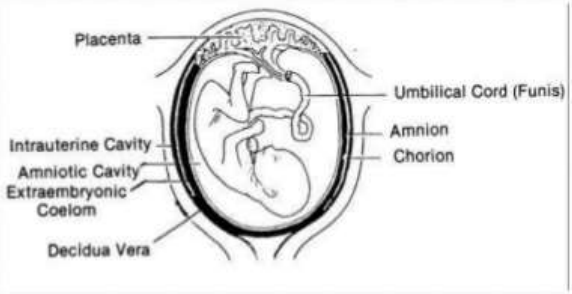
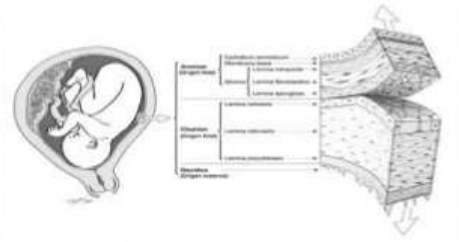


- Surrounds the developing fetus
- Derived from fetal tissue
- Amnion is translucent structure adjacent to amniotic fluid and provides nutrients
- Chorion is opaque membrane attached to the decidua

Histology

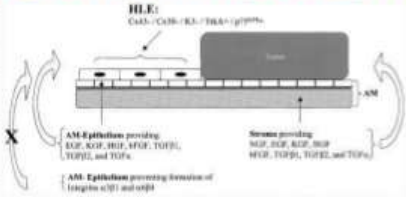


- Single layer of cuboidal epithelial cells
- A thick Basement Membrane
- Avascular stromal matrix , loosely attached to the chorion

Introduction

- Innermost layer forming the fetal membrane.
- First used by Davis in 1910 in skin transplant.
- First documented ophthalmic application for conjunctival surface reconstruction in 1940 by De Roth.
- Sorsby et al in 1946 reported its use in acute ocular burns.
- Kim and Tseng successfully reintroduced usage in 1995

Properties of Amniotic membrane



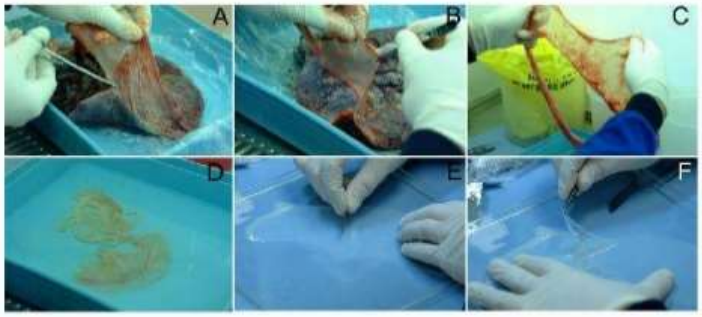
Facilitates migration of epithelial cells
Reinforcement of basal cell adhesion
Induction of epithelial cell differentiation and promotes goblet cell differentiation
Anti-inflammatory action reduces scarring and vascularization
bacteriostatic properties
Lack of Immunogenicity

- Cytokines, growth factors and protease inhibitors (IL4,6) EPG, FGF, TGF, HGF and 2- microglobulin.
- Exclusion of inflammatory cells with anti-protease activities
- Suppression of TGF- signalling system and myofibroblast differentiation of normal fibroblasts.
- Prolongation of life span and clonogenicity of epithelial progenitor cells.
- Promotion of non-goblet cells epithelial differentiation
- Promotion of goblet cells differentiation when combined with epithelial fibroblast

Collection

- Consenting Sero negative (Hepatitis B and C virus, Syphilis and HIV) maternal donors determined pre surgery
- elective caesarian section
- Under sterile conditions
- An antibiotic cocktail covering most of Gram –positive and Negative bacteria and fungi in Balanced Salt Solution for 24 hours
- Second wash of BSS
- Amnion separated from chorion

Harvesting Amniotic membrane



Preservation

- BSS containing Ampicilin, Streptomycin and Amphotericin B used.
- Scrapped manually to remove debris
- Amnion is clear and Transparent
- Nitrocellulose membranes of required size
- Epithelial/basement layer up.

- Preserved in solution containing Modified Eagle's Medium (MEM) and glycerol in 1:1 ratio with 3.3% l-glutamine, 25 ug/ml Gentamicin, 50 units/ml penicillin, 100ug/ml ciprofloxacin and 0.5 mg/ml Amphotericin B
- Stored in 50 ML wide mouthed screw capped irradiated transparent bottles at -80 Degrees

AMs are commercially available in two forms either cryopreserved or freeze-dried.

1. In **cryopreserved** type, the AM cryopreserved in a basal cell medium at -80C.

2.The **freeze-dried** AM can be sterilized by gamma-irradiation; however, AM treated this way may release a less amount of growth factors than conventionally cryopreserved membranes.

Indications

- Used either as a 'substrate' to replace damaged ocular tissue or
- as a 'Patch' (Biological dressing) or
- Combination of both

Techniques

Inlay or graft technique

In the inlay technique, the AM is applied as a permanent basement membrane substitute.
The main indications for this are persistent epithelial defects, corneal ulceration or to cover defects following excision of conjunctival tumors .
AM is sewn in with the epithelium/basement membrane side facing outwards.

using 10-0 nylon sutures, following wound debridement, so that neighboring recipient epithelial cells can migrate onto the AM and the wound begins to close .

In deep defects. corneal ulceration, multiple layers of AM can be used Epithelialization of the AM integrates AM into the host tissue. It remains detectable for months, sometimes years, and in defects of the cornea is even colonized by local keratocytes

Inlay

Onlay or patch technique

In the onlay technique, a large AM is temporarily placed on the surface of the eye as a "natural" patch. Unlike the inlay technique, where the AM remains permanently on the cornea, with the onlay technique the AM patch typically becomes detached from the surface of the cornea after one to two weeks.

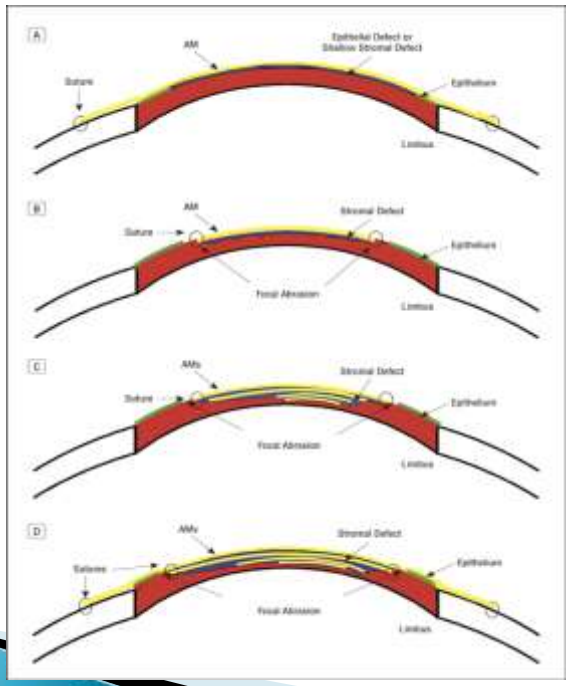
Classical indications range from; **acute burns** to acute **herpetic keratitis** and the acute stage of **Stevens-Johnson syndrome**. With these indications AM's biological properties, particularly its anti-inflammatory mechanisms of action, are used, although as mentioned above these last only a limited time .

Onlay

Inlay and onlay technique

This technique, also called the sandwich technique, is a combination of the two described above and is used mainly in serious disorders of the ocular surface such as deep and extensive corneal ulceration, or in surgical revisions .

The main purpose of the onlay is to protect the inlay and promote its epithelialization. This method is favored due to its high success rate.



Corneal diseases

1. Corneal ulcer.
2. Chemical burn.
3. Bullous keratopathy.

Corneal ulcer

1. Bacteriostatic effect.
2. Promote epithelial-basement membrane healing.
3. Patching effect.

Chemical burn

Partial or total limbal stem cell deficiency
Either alone or with limbal stem cell transplantation.



Bullous keratopathy

1. pain relief.

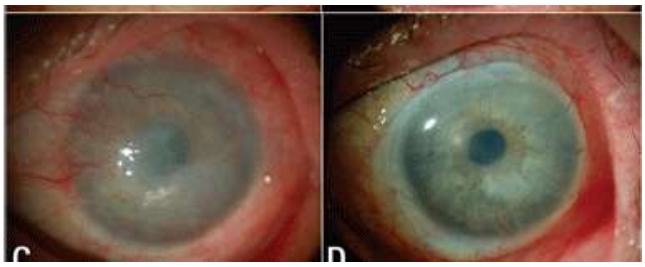
2. healing of persistent epithelial defect.

3. decrease ocular discomfort and pain.

Conjunctival diseases

- Stevens-Johnson Syndrome
- Symblepharon lysis
- Conjunctival surface reconstruction
- Pterygium surgery
- Post Trabeculectomy:bleb leakage or revision

Stevens–Johnson syndrome



Symblepharon

Pterygium

Complications

- Suture granuloma
- Persist ant inflammation
- Hematoma dehiscence
- Shrinkage of the graft
- Failure to achieve the intended effect
- Infection
- Dislodged or loose AM
- Hemorrhage
- Early disintegration